

INDOOR AIR QUALITY REASSESSMENT

**Marlborough District Court
45 Williams Street
Marlborough, Massachusetts**



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
November 2017

Background

Building:	Marlborough District Court
Address:	45 Williams Street, Marlborough, MA
Assessment Requested by:	Mike Lane, Administrative Office of the Trial Court
Reason for Request:	General indoor air quality (IAQ) assessment
Date of Assessment:	October 27, 2017
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Michael Feeney, Director, IAQ Program
Building Description:	Three-story brick/masonry building with occupied basement built in 1969
Building Population:	Approximately 50-60 employees, with up to several hundred members of the public visiting daily
Windows:	Openable

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below 800 parts per million (ppm) in all but two areas assessed, indicating adequate air exchange in most of the building.
- ***Temperature*** was within the recommended range of 70°F to 78°F in all areas assessed.
- ***Relative humidity*** was below the recommended range of 40% to 60% in most areas assessed, which is typical for weather conditions in the fall.
- ***Carbon monoxide*** levels were non-detectable in all areas assessed.

- ***Fine particulate matter (PM_{2.5})*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) in all areas assessed.

Ventilation

A heating, ventilating and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally-occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals.

Of note were concerns regarding dust and debris building up on flat surfaces. The HVAC system was originally equipped with a filter system that was mounted on rollers that slowly unrolled the filter medium over the opening to the AHU coils. The roller system is apparently no longer used since the equipment appears to be in disrepair. Filter medium is currently cut from bulk rolls and placed over the opening to the AHU coils. Depressurization of the opening by the HVAC fan is the only means by which the filter medium is held in place. IAQ staff examined the interior of the HVAC system and witnessed the filter medium fall to the floor of the duct after the AHU fan was deactivated.

This filter system provides minimal filtration of outdoor air with the filter in place, and no filtration if the filter is not in place. In addition, the filter medium needs to be physically cut to size which may be subject to poor fit. MDPH recommends tight-fitting filters of a Minimum Efficiency Reporting Value (MERV) of 8, which are adequate in filtering out pollen and mold spores (ASHRAE, 2012). Lack of filtration would likely account for the noted dust and debris on flat surfaces reported by building occupants.

It is also important to note that the HVAC system is nearly 50 years old. Efficient function of equipment of this age is difficult to maintain, since compatible replacement parts are often unavailable. According to the American Society of Heating, Refrigeration and Air-Conditioning Engineering (ASHRAE), the service life¹ for the various components of the

¹ The service life is the median time during which a particular system or component of ...[an HVAC]... system remains in its original service application and then is replaced. Replacement may occur for any reason, including,

HVAC system is between 20 to 30 years, assuming routine maintenance of the equipment (ASHRAE, 1991). Despite attempts to maintain the equipment, the optimal operational lifespan of this equipment has been exceeded.

Microbial/Moisture Concerns

Stained ceiling tiles were observed in a number of areas. Water-damaged ceiling tiles can indicate roof or plumbing leaks; extensive repairs were reportedly made to the roof and the exterior wall. Any leaks should be reported promptly to building maintenance staff to ensure they can be repaired and materials can be dried. The United States Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Once mold has colonized porous materials, they are difficult to clean and should be removed and discarded.

Other Concerns

Scented candles were observed in some areas; one candle was found lit during the assessment (Table 1). If candles are heated or burned, both volatile organic compounds (VOCs) and heated wax oils are vaporized. Paraffin wax fume can be a source of eye and respiratory irritation (CDC, 2011). The fuming of paraffin wax by heating or burning is not recommended in the indoor environment.

In a number of areas, items were observed on the floor, windowsills, tabletops, counters, bookcases and desks. The large number of items stored provides a source for dusts to accumulate. These items (e.g., papers, folders, boxes) make it difficult for custodial staff to clean. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

but not limited to, failure, general obsolescence, reduced reliability, excessive maintenance cost, and changed system requirements due to such influences as building characteristics or energy prices (ASHRAE, 1991).

Short Term Recommendations

1. Install a filter rack system in the fresh-air intake opening in place of the non-functioning filter roller system.
2. Once the filter rack is installed, use appropriate filters with a rating of MERV 8 or higher.
3. Given that the HVAC system appears to have had minimal filtration, it may be advised to have the interior of the duct system cleaned. The ductwork should be cleaned in a manner consistent with recommendations and guidance set by the National Air Duct Cleaners Association (NADCA).
4. Replace water-damaged ceiling tiles as needed.
5. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Drinking water during the day can help ease some symptoms associated with a dry environment (e.g., throat and sinus irritations).
6. Avoid the use of candles and minimize the use of scented products to avoid exposure to VOCs and other irritants.
7. Reduce the amount of items stored on flat surfaces to allow regular cleaning.
8. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: <http://mass.gov/dph/iaq>.

Long Term Recommendations

1. Given the age of the HVAC system, consideration should be given to having a ventilation engineer examine the HVAC system for upgrade or replacement.

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

ASHRAE. 1991. ASHRAE Applications Handbook, Chapter 33 “Owning and Operating Costs”. American Society of Heating, Refrigeration and Air Conditioning Engineers, Atlanta, GA.

ASHRAE. 2012. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 52.2-2012 -- Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size (ANSI Approved). 2012.

CDC. 2011. Paraffin wax fume. NIOSH Pocket Guide. April 4, 2011.
<https://www.cdc.gov/niosh/npg/npgd0477.html>.

MDPH. 2015. Massachusetts Department of Public Health. Massachusetts Department of Public Health Indoor Air Quality Manual: Chapters I-III. Available at:
<http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/>.

US EPA. 2008. “Mold Remediation in Schools and Commercial Buildings”. Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. September 2008. Available at: <http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings>

Location: Marlborough District Court

Address: 45 Williams St., Marlborough, MA

Indoor Air Results

Date:10/27/2017

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background (Outdoors)	398	ND	61	41	5					
Main entrance	991	ND	72	45	4	5	N	Y	Y	
109	604	ND	75	35	1	0	N	Y	Y	
110	597	ND	76	34	6	0	Y	Y	Y	
111	596	ND	75	35	1	2	Y	Y	Y	4 water-damaged ceiling tiles
112	581	ND	77	33	1	0	Y	Y	Y	
115	601	ND	74	35	1	0	Y	Y	Y	
120A	600	ND	74	35	1	0	N	Y	Y	3 water-damaged ceiling tiles
Clerk of Court Main office	623	ND	74	37	2	2	Y	Y	Y	
Clerk of Court main desk	638	ND	74	38	1	1	Y	Y	Y	
Court office	685	ND	75	35	1	1	Y	Y	Y	
Court room A	578	ND	73	37	1	0	Y	Y	Y	10+4 water-damaged ceiling tiles

ppm = parts per million

µg/m³ = micrograms per cubic meter

ND = non detect

Comfort Guidelines

Carbon Dioxide: < 800 = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

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Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
DA	584	ND	75	35	2	1	Y	Y	Y	10+ water-damaged ceiling tiles
Judge's office A	622	ND	75	35	1	0	Y	Y	Y	4 water-damaged ceiling tiles
Judge's office A room	656	ND	75	37	2	0	Y	Y	Y	4 water-damaged ceiling tiles
Jury delivery room A	564	ND	74	36	1	0	Y	Y	Y	10+ water-damaged ceiling tiles
Jury pool	664	ND	75	36	2	0	Y	Y	Y	3 water-damaged ceiling tiles
Lock up control	616	ND	74	36	2	0	N	Y	Y	
Main lobby	733	ND	72	41	1	20+	N	Y	Y	
Probate judge's lobby	609	ND	74	35	2	0	Y	Y	Y	
Probation	630	ND	72	40	1	0	Y	Y	Y	Lit candle
Probation chief	599	ND	74	37	1	0	Y	Y	Y	Candle
Probation conference	561	ND	74	36	1	0	N	Y	Y	
Probation front desk	873	ND	75	36	1	2	Y	Y	Y	

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								Supply	Exhaust	
Probation office	703	ND	75	34	1	2	Y	Y	Y	
Storage	560	ND	72	44	1	0	N	Y	Y	

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